Supply Chain Optimization

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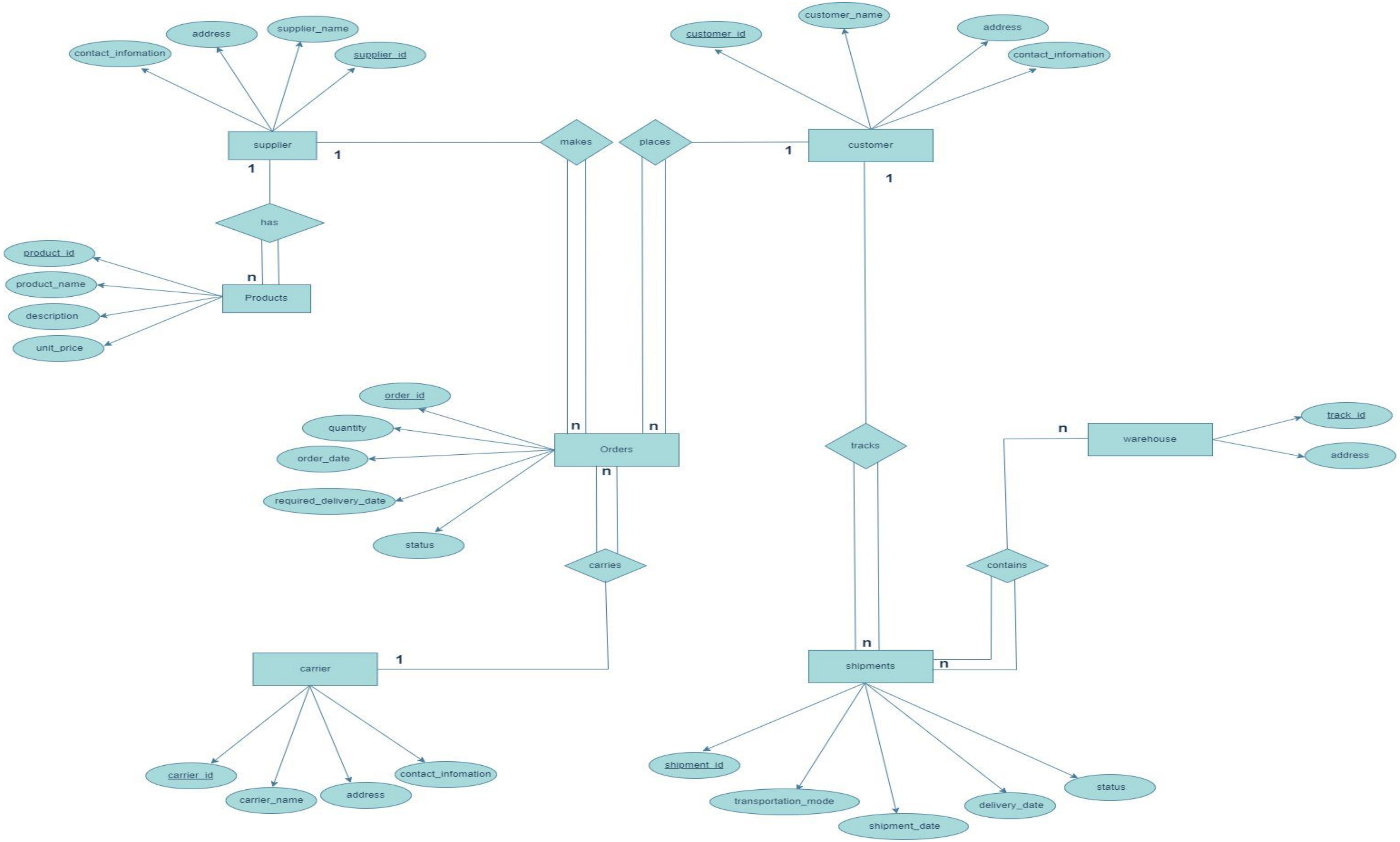
- **SUBJECT :-**
- Database Management System

Overview of Problem Statement

The problem statement involves modeling a supply chain system where products are supplied by various suppliers to customers through carriers. Orders are placed by customers and managed through shipments. The system also tracks warehouse information and links shipments to specific warehouses. The database structure allows for the management and tracking of the entire supply chain process, from suppliers to customers, through orders, shipments, and warehouses.

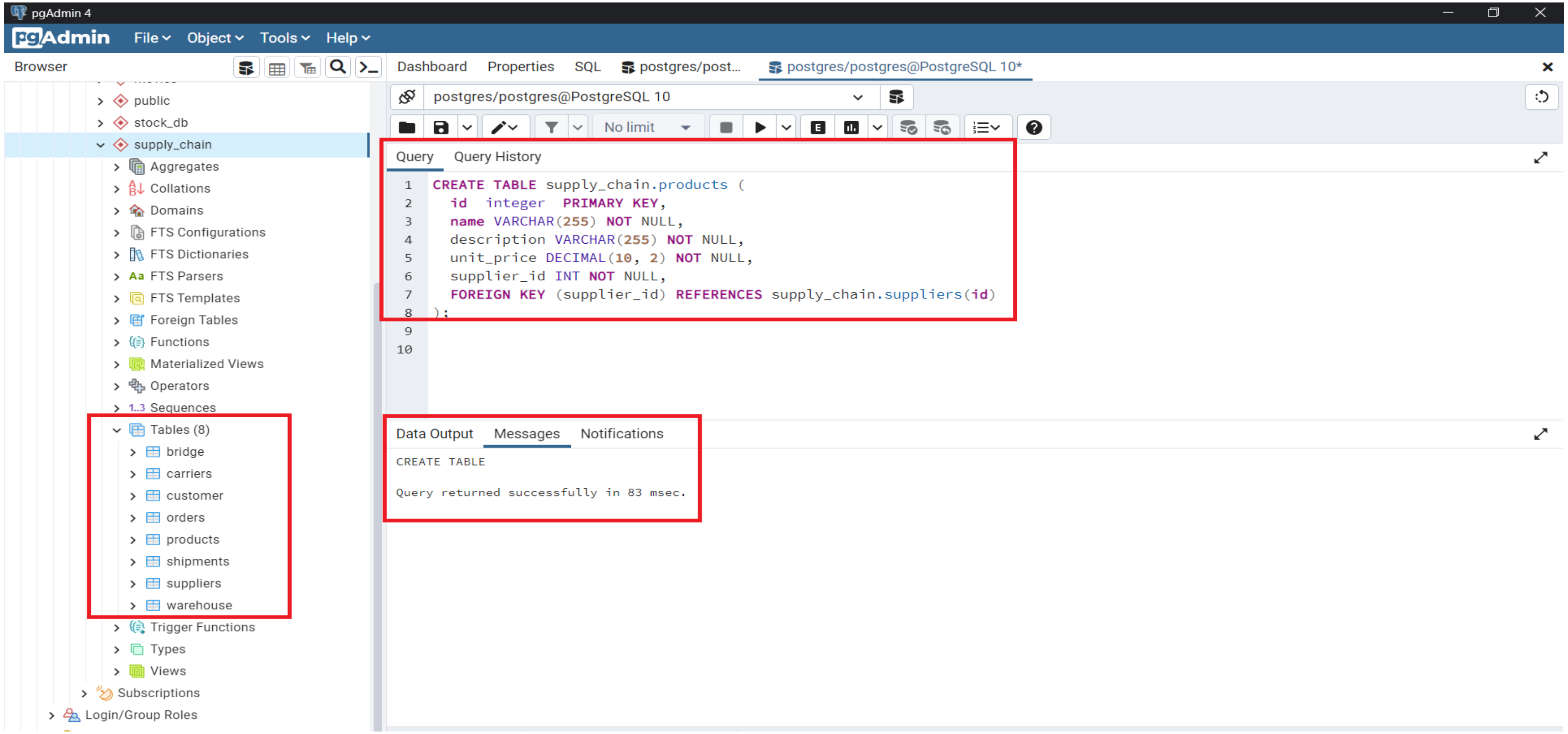
- **Supplier and Product Management :-** Record supplier information and Describe products and link them to suppliers.
- **Order Processing :-** Capture and track customer orders.
- **Shipment Tracking :-** Record shipment details, including transportation mode, dates, and status.

ER Diagram



supplier
supplier_id
supplier_name
address
contact_infomation
1
makes
places
customer
customer_id
customer_name
address
contact_infomation
1
1
1
has
n
Products
product_id
product_name
description
unit_price
n
n
Orders
order_id
quantity
order_date
required_delivery_date
status
n
carries
tracks
1
carrier
carrier_id
carrier_name
address
contact_infomation
warehouse
n
track_id
address
contains
n
n
shipments
shipment_id
transportation_mode
shipment_date
delivery_date
status

Data Definition Language :-



```sql
CREATE TABLE supply_chain.products (
  id  integer  PRIMARY KEY,
  name VARCHAR(255) NOT NULL,
  description VARCHAR(255) NOT NULL,
  unit_price DECIMAL(10, 2) NOT NULL,
  supplier_id INT NOT NULL,
  FOREIGN KEY (supplier_id) REFERENCES supply_chain.suppliers(id)
);
```

```
CREATE TABLE

Query returned successfully in 83 msec.
```

Simple SQL & Relational Queries

[1] Query to Retrieve the Number of Orders for a Specific Customer :-

❖SQL Query :-

- SELECT c.id, COUNT(*) AS order_count FROM supply_chain.orders o, supply_chain.customer c WHERE o.customer_id = c.id And c.id = 1

  GROUP BY c.id;

❖Relational Query :-

- π customer_id, count(orders) (σ_customer_id=1 (orders ⋈ customer))

Simple SQL & Relational Queries

[2] Query to Retrieve all products that have the highest unit price :-

❖SQL Query :-

- SELECT * from supply_chain.products where unit_price in (select MAX(unit_price) from supply_chain.products);

❖Relational Query :-

- π (σ_unit_price=π_max(unit_price) (products))

Simple SQL & Relational Queries

[3] Query to Retrieve Supplier with total Products :-

❖SQL Query :-

- SELECT s.name AS supplier_name, COUNT(p.id) AS product_count FROM supply_chain.suppliers s , supply_chain.products p where s.id = p.supplier_id GROUP BY s.name;

❖Relational Query :-

- π_{s.name,ρ_{s.id,COUNT(p.id)→product_count}(⋈_{s.id=p.supplier_id}(π_{id, name}(suppliers) ⋈ π_{id}(products))))

Simple SQL & Relational Queries

[4] Query to Retrieve Shipped Shipments Sorted by Shipment Date :-

❖SQL Query :-

- SELECT * FROM supply_chain.shipments WHERE status = 'Delivered' ORDER BY shipment_date ASC;

❖Relational Query :-

- π shipment_id, transportation_mode, shipment_date, delivery_date, status(σ status=’Delivered’ (σ shipment_date ASC (shipments)))

Simple SQL & Relational Queries

[5] Count the number of shipments in transit:-

❖SQL Query :-

- SELECT COUNT(*) AS transit_shipments FROM supply_chain.shipments WHERE status = 'In Transit’;

❖Relational Query :-

- π_sum(quantity) (σ_status='In Transit' (orders ⋈ shipments))

Complex SQL & Relational Queries

[1] Query to Find Customers with Multiple Orders :-

❖SQL Query :-

- SELECT c.id AS customer_id, c.name AS customer_name, COUNT(o.id) AS order_count FROM supply_chain.customer c

  JOIN supply_chain.orders o ON c.id = o.customer_id

  GROUP BY c.id, c.name HAVING COUNT(o.id) > 1;

❖Relational Query :-

- π customer_id, customer_name, order_count (σ order_count>1 (γ customer_id, customer_name, order_count:COUNT() (customer⋈ id = customer_id orders)))

Complex SQL & Relational Queries

[2] Query to Retrieve Products Ordered by a Specific Customer with Shipment Details :-

❖SQL Query :-

- SELECT c.name AS customer_name, s.id AS shipment_id,s.status,s.delivery_date, w.address AS warehouse_address

  FROM supply_chain.customer c

  JOIN supply_chain.shipments s ON c.id = s.customer_id

  JOIN supply_chain.bridge b ON s.id = b.shipment_id

  JOIN supply_chain.warehouse w ON b.track_id = w.id

  WHERE c.id = 1;

❖Relational Query :-

- π customer_id, customer_name, order_count (σ order_count>1 (γ customer_id, customer_name, order_count:COUNT() (customer⋈ id = customer_id orders)))

Complex SQL & Relational Queries

[3] Query to Retrieve Products with the Lowest Total Order Quantity:-

❖SQL Query :-

```
• SELECT p.id AS product_id,p.name AS product_name, SUM(o.quantity) AS total_order
  FROM supply_chain.products p, supply_chain.suppliers s,supply_chain.orders o
  WHERE p.id = s.id AND s.id=o.supplier_id
  GROUP BY p.id
  ORDER BY total_order
 LIMIT 1;
```

❖Relational Query :-

- π product_id, product_name, total_order(γ product_id, product_name, total_order:SUM(quantity)(σp.id = s.id AND s.id = o.supplier_id(products×suppliers×orders)))

Complex SQL & Relational Queries

[4] Query to Find the Customers Who Have Not Placed Orders:-

❖SQL Query :-

- SELECT c.id AS customer_id, c.name AS customer_name

  FROM supply_chain.customer c

  LEFT JOIN supply_chain.orders o ON c.id = o.customer_id

  WHERE o.id IS NULL;

❖Relational Query :-

- π customer_id, customer_name(σ o.id IS NULL (customer⋉orders))

Complex SQL & Relational Queries

[5] Retrieve the Top 5 Customers with the Highest Total Order Value :-

❖SQL Query :-

```
• SELECT c.id AS customer_id,c.name AS customer_name,  SUM(o.quantity * p.unit_price) AS
  total_order_value FROM supply_chain.customer c
  JOIN  supply_chain.orders o ON c.id = o.customer_id
  JOIN  supply_chain.suppliers s ON s.id = o.supplier_id
  JOIN  supply_chain.products p ON p.id = s.id
  GROUP BY c.id, c.name
 ORDER BY total_order_value DESC
 LIMIT 5;
```

❖Relational Query :-

- πcustomer_id, customer_name, total_order_value(γ customer_id, customer_name, total_order_value:SUM(quantity \timesunit_price) (customer⋈ id = customer_id orders⋈ supplier_id = id suppliers⋈ id = supplier_id products))

Contribution

- ER diagram & PPT

  Jinansh Shah

  Gunjan Sethi

- Database Creation & Queries

  Jeevan RajpurRohit

  Aditya Prajapati

  Aayush Contractor

Thank You